WHITE LAKE TMDL FOR CHLORIDE

SUBSEGMENT 050703

US EPA Region 6

With cooperation from the
Louisiana Department of Environmental Quality
Office of Environmental Assessment
Environmental Technology Division

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL has been developed for chloride for White Lake.

White Lake is located in the southeastern portion of the Mermentau River Basin. White Lake subsegment 050703 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for propagation of fish and wildlife and was ranked as high priority for TMDL development. Louisiana's water quality standards for chloride, sulfate, and TDS are applied as follows:

"Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chloride, sulfate, and TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 250, and 500 mg/l for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies."

Four years (January, 1995 – December, 1998) of monthly LDEQ monitoring data on White Lake (WQ site 310) were assessed to determine if the propagation of fish and wildlife use was being maintained. Analysis of the data shows that the propagation of fish and wildlife use is not protected. Greater than 30% of the measurements exceeded the chloride criterion of 250mg/l (see Appendix A). Therefore, a TMDL was developed to protect the propagation of fish and wildlife.

For the purpose of TMDL development, the criterion of 250 mg/L was applied. The chloride TMDL was developed based on simple dilution calculations using average flow and the state chloride criterion of 250 mg/L for this subsegment. The TMDL calculation includes a wasteload allocation, a load allocation, and a margin of safety. A 39.5% reduction in chloride loading will be needed to meet the standard for the propagation of fish and wildlife.

1. Introduction

White Lake subsegment 050703 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for the propagation of fish and wildlife. Subsegment 050703 was ranked as high priority (ranking of 1) on the 1998 List. A TMDL for chloride was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources for the pollutant of concern and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and growth.

2. Study Area Description

2.1 White Lake, Subsegment 050703

White Lake is located southwest of Abbeville, Louisiana within segment 0507 in the Mermentau River Basin. The Mermentau River Basin includes the prairie and coastal regions of the State and is bounded on the north and east by the Vermilion-Teche River Basin, on the west by the Calcasieu River Basin, and on the south by the Gulf of Mexico. The major land uses are listed in Table 1.

Table 1. Land Use (acres) in segment 0507 of the Mermentau River Basin

URBAN	EXTRACTIVE	AGRICULTURAL	FOREST	WATER	WETLAND
4693 (0.8%)	237 (0.0%)	172090 (28.4%)	7339 (1.2%)	134307 (22.1%)	288120 (47.5%)

2.2 Water Quality Standards

The designated uses for White Lake include the propagation of fish and wildlife. Chloride is a water quality criterion used for assessment of use support. Louisiana's water quality standard for chloride is 250 mg/L (Subsegment 050703).

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* (LDEQ, 1998) as affecting the water quality of White Lake are designated as "Irrigated crop production." Additional suspected sources listed in the Court Ordered 1999 303(d) list include non-irrigated crop production, minor industrial point sources, petroleum activities, and "spills".

2.3.1 Point Sources

There is one permitted facility (with known flow information) discharging sanitary wastewater into Subsegment 050703. The flow of this discharger is 4,375 gallons per day. The information for this discharger is listed in Table 2.

Table 2. Dischargers in Subsegment 050703

Facility	Permit	Receiving Water	Flow (MGD)	Load (lb/day)
Columbia Gulf Transmission Company-Pecan I	LA0089575	Bayou Canal	0.004375	9.12

2.3.2 Nonpoint Sources

The predominant land uses in the area of White Lake are agriculture and wetlands, both of which can contribute chloride loads through runoff. (LDEQ, 1993)

3. TMDL Load Calculations

3.1 Current Load Evaluation

Chloride loads have been calculated using the instream chloride concentration and the flow of the stream. The following equation can be used to calculate chloride loads.

Equation 1. C x Q in cfs x 5.39 or C x Q in MGD x 8.34

Where: C = concentration in mg/L
Q = stream flow in cfs or MGD

A traditional expression of the loading may be developed by setting one critical or representative flow and concentration, and calculating the chloride load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use.

For the purpose of calculating current loading on this waterbody the average chloride concentration was calculated using monthly LDEQ monitoring data on White Lake (WQ site 310). WQ site 310 was used because of its multiple years of chloride data. In White Lake, the monthly chloride concentrations ranged from 17.4 mg/L to 3681 mg/L over a 4-year period (January, 1995-December, 1998). The average chloride concentration was 413.32 mg/L (see Appendix A). In addition, the average flow for White Lake is 727.15 ft^3/sec (see Appendix B). Using these values and Equation 1 it is estimated that the current loading is 1,619,941 lb/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 (or Harmonic mean flow) at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. The load reduction needed to meet the water quality standard for propagation of fish and wildlife in White Lake at 727.15 cfs is 640,106 lb/day (39.5% reduction). This was obtained by calculating the allowable TMDL at 727.15 cfs for the 250 mg/L criterion (979,835 lb/day) and subtracting this load from the observed load (1,619,941 lb/day).

TMDL= Cstd x Q cfs x 5.39, where Cstd= 250mg/l, Q= 727.15cfs

TMDL= 250mg/l x 727.15cfs x 5.39 = 979,835 lb/day

Current Load - TMDL = Load Reduction

1,619,941 lb/day – 979,835 lb/day = 640,106 lb/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain an in-stream chloride concentration of 250 mg/L on this subsegment.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a chloride concentration of 250 mg/L and the total volume of all the wastewater dischargers (4,375 gallons/day).

250 mg/L * Q in MGD * 8.34 = WLA

Where Q = Total volume of sanitary wastewater discharges into White Lake

WLA for all dischargers = 9.12 lb/day

3.4 Load Allocation (LA)

The load allocation for a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA)= LA

LA at an instream flow of 727.15 cfs = 979,826 lb/day

979,835 lb/day (TMDL@ 727.15 cfs) – 9.12 lb/day (WLA) = 979,826 lb/day

3.5 Seasonal Variation

Louisiana's water quality standard for chloride is for January through December. Therefore, no seasonal TMDL for chloride was developed.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for chloride, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Treating chloride as a conservative pollutant, that is, a pollutant that does not degrade in the environment.
- Using the chloride water quality standard of 250 mg/l rather than using site-specific criteria and seasonal variability factors.
- Using the design flow (where available) of the point source dischargers rather than actual average flow rates, which are typically much lower.

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) (LDEQ, 1996) (LDEQ, 1998) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or

removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Mermentau River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

LDEQ, 1993. Louisiana Department of Environmental Quality. *State of Louisiana Water Quality ManagementPlan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

LDEQ, 1996. Louisiana Department of Environmental Quality. *State of Louisiana Water Quality ManagementPlan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

LDEQ, 1998. Louisiana Department of Environmental Quality. *State of Louisiana Water Quality ManagementPlan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

LDEQ, 2001. **http://www.deq.state.la.us/surveillance/wqdata/0310wqng.txt**

APPENDIX A Chloride data

White Lake southwest of Abbeville, Louisiana
(Source: http://www.deq.state.la.us/surveillance/wqdata/0310wqng.txt)

This data last updated on: 08/06/00

DATE	TIME	Chlorides mg/L
12/09/98	1125	308.0
11/24/98	1143	318.0
10/28/98	1120	310.0
10/14/98	1108	347.0
09/23/98	0954	623.0
09/09/98	1111	3681.0
08/26/98	1004	532.0
08/12/98	1043	443.0
07/29/98	1054	249.0
07/15/98	0953	162.0
06/24/98	1032	792.0
05/12/98	1020	101.0
03/10/98	1045	120.0
01/13/98	1010	270.0
11/18/97	1000	314.0
09/09/97	0950	1146.0
07/15/97	1030	76.1
05/13/97	1020	81.6
03/11/97	1011	85.6
01/07/97	1000	168.0
11/19/96	1115	372.0
09/10/96	1030	17.4
07/09/96	1100	316.0
05/14/96	0935	405.0
03/12/96	1015	362.0
01/09/96	1055	337.0
11/13/95	1000	297.0
09/11/95	0930	.
07/10/95	0940	103.8
05/08/95	0912	77.5
03/13/95	0907	219.0
01/09/95	0915	179.0

The chloride criterion (250mg/l) was exceeded in 58% of the samples (18 of 31 samples) from January 1995 to December 1998.

APPENDIX B Flow Information

White Lake (Subsegment 050703) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice, 2.11 CFS per square mile, and a drainage area for White Lake (Subsegment 050703) of 344.62 square miles, the average stream flow is estimated to be 727.15 CFS.

2.11 CFS/sq mi. * 344.62 sq mi. = 727.15 CFS